SUMMARY
DESIGN SPECIFICATIONS FOR SYSTEM FOUR
(Revised as of June 28, 1956)

1. The receivers and associated equipment shall cover 145-40,000 mc/s with a weight of not more than 450 pounds and fit the space available in the vehicle involved. The entire assembly including antennas and cables (other than power connections) shall be mounted on the vehicle hatch cover or acceptable replica thereof. A prototype containing all functions of the system shall be flying in the vehicle on 1 November.

2. All-frequency, simultaneous surveillance receivers using TWT R.F. amplification and multiple filter outputs were desired but could not be supplied within the weight and development time requirements above.

3. The receivers shall be superheterodynes with high gain, automatic scanning, automatic recording and automatic lock-on below 10,750 mc/s. The noise figures of these receivers will be approximately 15 db. NRL work has shown that this value is practical with the tuners to be used. Crystal video receivers with R.F. band-pass filters will be used above 10,750 mc/s. These crystal video receivers shall have sensitivities of -45 dbm or better (average). These sensitivities have been demonstrated in the equipment supplied.

4. The bands will be as follows:

Bands 1 and 2	150-300 *mc/s
Band 3	300-600 **mc/s
Band 4	600-1100 **mc/s
Band 5	1100-2600 mc/s T
Band 6	2400-5000 mc/s T
Band 7	4800-7600 mc/s T
Band 8	7400-10,750 mc/s T
Band 9	10,000-18,000 mc/s H
Band 10	17,000-26,000 mc/s H
Band 11	25,000-40,000 mc/s H

The total package of receivers, recorders, and antennas shall be assembled as a group of individual boxes. This requirement anticipates the need at some future date to add improved receivers or recorders by removing one or more of the boxes being currently developed.

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* This band will be divided into two receivers if weight allows.
** The APR-13 tuning heads are to be used.
T The APR-9 tuning heads are to be used.
H QRC-11 filter and detector assemblies are to be used.

5. The antennas shall be in pairs giving left-right indication on a time-sharing basis. This is not practical, however, for the 150-300 mc/s region due to the restriction on the antenna location. All antennas must be mounted on the hatch cover. Insofar as is practical, the antenna coverage patterns (except those above 10 kmc/s) will be 20° in elevation and 90° in azimuth with the elevation pattern having a cosec. type of pattern. Above 10 kmc/s, the pattern desired is 45° in azimuth and elevation with antennas placed to left and right of the vertical to look downward so that the patterns overlap at the half power point. The 10-40 kmc/s outputs will be mixed with no time sharing of the left-right antennas.

6. The tape recorder shall be a 14-channel 1" tape recorder running at 3 3/4 inches/second and having a frequency response of 100-6000 kc/s (3 db. points) and a dynamic range as large as the state of the art will allow. Wow and flutter should be the minimum comensurate with the design limitations of space, weight and power supply. It shall carry ten hours of tape and be capable of running continuously for a ten-hour period. A 1000 cycle tone of accuracy not less than two parts in 10^4 will be recorded on one of the channels at all times. This tone shall be the same tone recorded on System One and System Three when the three systems are carried together and shall be turned on and off in all three systems simultaneously. System Four will have its own source of 1000 cycle tone to be used if desired. In addition to recording the audio outputs from AM detectors on all receivers, the tape recorder will record FM outputs from all superheterodyne receivers. These FM outputs may all be on the same tape channel and preferably, but not necessarily tagged as to the receiver from which they originate. C.W. energy present in any of the receivers will be recorded with the energy from the intercepted signal contributing in a recognizable way to the energy in the recording. Indicators will be recorded from which the frequency of the signal and antenna (left or right) making the intercept can be deduced. A fast-acting limiter type of AGC will prevent saturation of the receiver circuits and tapes. This action will not start until 3/4 of the dynamic range of the system.has been passed and will be approximately linear within the range of its action.

7. The video recorder will be one of two types listed below. The first type is preferred but the contractor will determine whether it can be produced in the time available. The first type is a continuously scanning raster type with intensity modulation presented on a phosphor screen and photographed on a constantly moving film. If this system can give 40 db. dynamic range without more than 5 db. deterioration of signal to noise and use the same weight of film as the second type, it would be desirable. Should this not be practical, the recorder of the contractor's exhibit on System Four of 27 April shall be used. In either case, a twenty-four hour clock mechanism easily accessible to maintenance people shall be mounted (along with the counter used as a picture connotator) so as to show clock time for correlation with other data. This clock mechanism shall show seconds, minutes and hours to the nearest second over a 24-hour period.

8. All power supplies shall be contained within the package and fastened to the hatch cover so that with a minimum of cable connecting, the hatch cover of the vehicle can be replaced with the System Four package.

9. The video recorder will be programmed so that it will search all receiver outputs and photograph outputs from those locked-on to a signal. No rephotographing of a locked-on signal will occur. The video programmer after one series of photographs of a lock-on, will ignore this lock-on in its search for other signals to photograph. The photographing time on each lock-on will be adjustable from .1 second to 100 seconds. This setting should be made independently for each receiver output.

10. Should weight allow, a 50-100 mc/s receiver using the hatch cover structure (or a part of it) as an antenna may be added to the system. The reduction of weight in the 10-40 kmc/s receivers (60 to 15 pounds) resulting from crystal-video receiver use may permit this.

11. Spare parts, test equipment and ground analysis equipment will be developed and produced in accordance with operational needs and technical factors of the system. The customer and contractor will establish the final specifications for these units following a contractor's proposal.